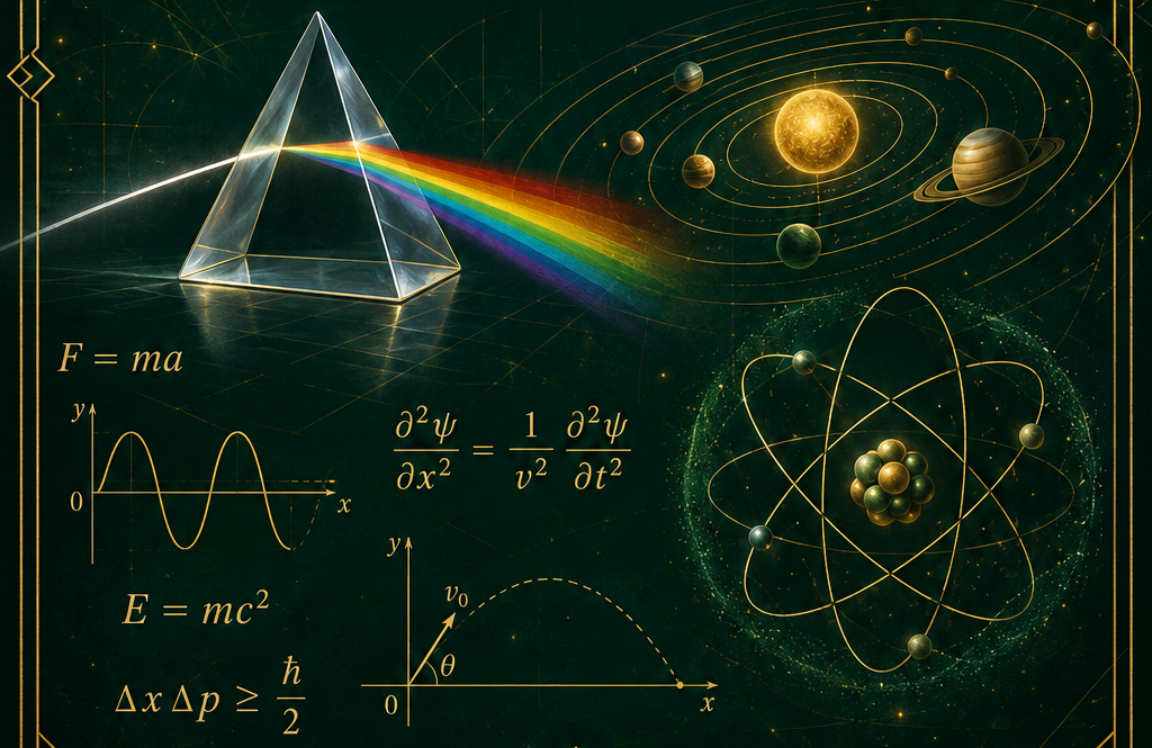
IBDP PHYSICS

100 AI PROMPTS

for Smarter Revision *and* Exam Prep

Active recall, exam technique, and mark-scheme thinking — without cheating.



by James R. Martin

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How to Use This Book

For a long time, high-quality tutoring has been a major contributor to elite academic achievement. Used well, AI can now act as a powerful tutor that most students and parents could not previously afford.

This book is a **starting point**, not a rulebook. Each prompt is designed to help you revise, test your understanding, and think more clearly — not to give perfect answers. You are encouraged to **adapt, improve, and remix** these prompts.

You are learning how to think carefully about the questions you ask — a skill that will matter far beyond these exams.

Note on Exam Boards and Syllabi

This revision guide is designed for the International Baccalaureate Diploma Programme (IBDP) Physics course, covering both Standard Level (SL) and Higher Level (HL) content. The prompts align with the IB Physics syllabus and reflect the emphasis on conceptual understanding, quantitative problem solving, and the nature of science that characterises this course.

IB Physics assessment consists of Paper 1 (multiple choice questions testing breadth of knowledge), Paper 2 (structured and extended response questions requiring calculations and explanations), and Paper 3 (HL only, covering options and data-based questions). The Data Booklet is available in all papers and contains formulae, constants, and reference data — learning to navigate it efficiently is a key exam skill.

The Internal Assessment (IA) is an individual scientific investigation worth 20% of your final grade. It is assessed against criteria including Personal Engagement, Exploration, Analysis, Evaluation, and Communication. Several prompts in this guide specifically target practical skills and IA preparation to help you design, execute, and write up a strong investigation.

HL-only topics and extensions are indicated where relevant, including wave phenomena, electromagnetic induction, quantum physics, and the more advanced treatment of fields and circular motion. SL students should focus on core prompts and use HL-tagged prompts as extension material to deepen conceptual understanding.

Throughout your revision, use IB command terms precisely — 'define', 'explain', 'calculate', 'deduce',

'discuss', and 'evaluate' each require different levels of response. Practise expressing answers with appropriate significant figures and units, and always reference the Data Booklet formulae rather than memorising equations that are provided.

Contents

Section 1

Measurements and Uncertainties

Measurements and uncertainties form the foundation of experimental physics in the IB programme, establishing how scientists quantify the reliability of their data. Understanding the difference between systematic and random errors, and knowing how to propagate uncertainties through calculations, is essential for both Paper 2 and your IA.

This topic covers SI units, significant figures, scientific notation, and the estimation of uncertainties in derived quantities. You must be able to express measurements with appropriate precision and calculate percentage and absolute uncertainties for sums, products, and powers.

These prompts develop the quantitative reasoning and error analysis skills that IB Physics examiners expect to see applied consistently across all topics, not just in dedicated measurement questions.

Prompt 1: SI Units and Dimensional Analysis

Copy this prompt into your AI tool:

Lay out me with five derived physical quantities and ask me to express each in terms of fundamental SI units. Then give me an equation and ask me to verify its dimensional consistency. Challenge me with one equation that is dimensionally correct but physically incorrect.

What this helps you practise:

Expressing derived units and checking dimensional consistency

How to use it well:

Use this prompt to build fluency with SI units, which

helps you catch errors in calculations and is directly tested on Paper 1 multiple choice questions.

Prompt 2: Systematic vs Random Errors

Copy this prompt into your AI tool:

Set up five experimental scenarios and ask me to identify whether the dominant source of error in each is systematic or random. For each, challenge me to suggest how the error could be reduced and how it would affect the accuracy or precision of results.

What this helps you practise:

Distinguishing between systematic and random errors in experiments

How to use it well:

This distinction is frequently tested in Paper 2 and is essential for the Evaluation criterion of your IA — practise identifying error types in varied contexts.

Prompt 3: Uncertainty Propagation Calculations

Copy this prompt into your AI tool:

Give me four calculations involving measured quantities with stated uncertainties: one addition, one multiplication, one division, and one involving a power. Ask me to propagate the uncertainties correctly and express the final answer with appropriate absolute and percentage uncertainties.

What this helps you practise:

Propagating uncertainties through multi-step calculations

How to use it well:

Run this prompt with different combinations of operations to ensure you can handle the uncertainty propagation questions that appear on Paper 2 and in IA analysis.

Prompt 4: Significant Figures and Scientific Notation

Copy this prompt into your AI tool:

Offer ten numerical values and ask me to state the number of significant figures in each. Then give me five calculations and ask me to express each answer to the appropriate number of significant figures. Include cases involving leading zeros and trailing zeros.

What this helps you practise:

Applying significant figure rules to measurements and calculations

How to use it well:

Significant figure errors cost marks across all papers — use this prompt to eliminate careless rounding mistakes that accumulate over an exam.

Prompt 5: Graphical Analysis and Error Bars

Copy this prompt into your AI tool:

Give me a data set with uncertainties and ask me to explain how I would plot error bars, draw a best-fit line, and determine maximum and minimum gradient lines. Then quiz me on calculating the uncertainty in the gradient and y-intercept from these lines. SL students focus on plotting error bars and drawing best-fit lines, while HL students should also determine fractional and percentage uncertainties from gradient analysis. Incorporate a TOK perspective: Evaluate to what extent models in physics represent reality versus serving merely as useful predictive tools, and discuss the epistemological status of scientific models.

What this helps you practise:

Analysing graphs with error bars and uncertainty in gradients

How to use it well:

Graphical analysis with error bars is a core IA skill

and appears in Paper 3 data-based questions — practise the full process from data to uncertainty in slope. This also builds TOK connections for your exhibition or essay.

Prompt 6: Order of Magnitude Estimation

Copy this prompt into your AI tool:

Pose five Fermi estimation questions related to physics contexts — such as the number of atoms in a human body or the energy in a lightning bolt. Ask me to make reasonable assumptions, estimate the answer to the nearest order of magnitude, and evaluate the sensitivity of my estimate to each assumption.

What this helps you practise:

Making order of magnitude estimates with justified assumptions

How to use it well:

Estimation questions test scientific thinking and appear on Paper 1 — practise making reasonable assumptions and checking whether your answer is physically sensible.

Prompt 7: Linearisation of Non-Linear Relationships

Copy this prompt into your AI tool:

Supply a non-linear physical relationship and ask me to determine what variables I should plot to obtain a straight-line graph. Then ask me to explain how to extract the physical constants from the gradient and intercept of the linearised graph.

What this helps you practise:

Transforming non-linear data into linear relationships for analysis

How to use it well:

Linearisation is fundamental to IB Physics data analysis — use this prompt to practise the algebraic

rearrangement and graphical interpretation required for your IA.

Prompt 8: Vectors and Scalars in Measurement

Copy this prompt into your AI tool:

Give me eight physical quantities and ask me to classify each as a vector or scalar. For the vectors, ask me to resolve them into components and reconstruct them from components. Then present a problem requiring vector addition of two forces at an angle.

What this helps you practise:

Classifying and resolving vector and scalar quantities

How to use it well:

Vector resolution underpins mechanics and field theory — establish this foundational skill early so it supports your work across all subsequent topics.

Prompt 9: Accuracy, Precision, and Reliability

Copy this prompt into your AI tool:

Provide four sets of experimental results described in words and ask me to evaluate each for accuracy, precision, and reliability. Ask me to explain the distinction between these three concepts and describe how each could be improved through changes in experimental design.

What this helps you practise:

Evaluating experimental results for accuracy, precision, and reliability

How to use it well:

These concepts are tested through short-answer questions on Paper 2 and are essential vocabulary for the Evaluation section of your IA report.

Prompt 10: Measurement Uncertainty Exam Practice

Copy this prompt into your AI tool:

Create a Paper 2 style structured question that provides experimental data with uncertainties and asks me to process the data, propagate uncertainties, plot an appropriate graph, and draw conclusions. Mark my response against IB standards, noting where method marks apply.

What this helps you practise:

Completing structured measurement and uncertainty exam questions

How to use it well:

Use this as a timed practice exercise to simulate the data processing questions that regularly appear in Section B of Paper 2.

Prompt 11: Percentage Uncertainty and Instrument Resolution

Copy this prompt into your AI tool:

Lay out five measuring instruments with their resolutions and ask me to calculate the absolute and percentage uncertainty for each measurement. Then challenge me to determine which measurement contributes the greatest percentage uncertainty to a derived quantity and explain why this matters.

What this helps you practise:

Calculating instrument uncertainties and identifying dominant error sources

How to use it well:

Identifying the dominant uncertainty helps focus improvement efforts in experiments — a key skill for the Evaluation criterion of your IA.

Section 2

Mechanics

Mechanics is the largest topic in IB Physics, covering kinematics, forces, work, energy, power, and momentum. It provides the analytical framework for understanding motion and its causes, forming the basis upon which many other topics build.

You must be proficient in both graphical and algebraic approaches to kinematics, understand Newton's laws qualitatively and quantitatively, and apply conservation laws for energy and momentum. Free-body diagrams are essential tools that IB examiners expect to see in force analysis questions.

These prompts develop your ability to model physical situations mathematically, select appropriate equations from the Data Booklet, and interpret results in physical terms — the combination of skills that IB Physics examiners reward with top marks.

Prompt 12: Kinematic Equations Application

Copy this prompt into your AI tool:

Construct three motion problems of increasing difficulty involving constant acceleration. For each, ask me to identify known and unknown quantities, select the appropriate kinematic equation from the Data Booklet, solve algebraically, and check my answer for physical reasonableness including appropriate units and significant figures.

What this helps you practise:

Selecting and applying kinematic equations to motion problems

How to use it well:

Use this prompt to develop a systematic approach to

kinematics: list knowns, select the equation that links them to the unknown, and always check units.

Prompt 13: Motion Graphs Interpretation

Copy this prompt into your AI tool:

Show me displacement-time, velocity-time, and acceleration-time graphs for various motions and ask me to describe the motion qualitatively. Then ask me to calculate quantities such as velocity from a displacement-time gradient, displacement from a velocity-time area, and acceleration from a velocity-time gradient.

What this helps you practise:

Extracting physical information from motion graphs

How to use it well:

Graph interpretation appears on both Paper 1 and Paper 2 — practise connecting the graphical features to the physical motion they represent.

Prompt 14: Free-Body Diagram Construction

Copy this prompt into your AI tool:

Test me on free-body diagrams for five physical situations — an object on an inclined plane, a hanging mass, a car braking, a skydiver at terminal velocity, and a satellite in orbit. Evaluate whether I include all forces, label them correctly, and show their relative magnitudes. At HL, extend your answer to include the forces acting on a charged particle in a magnetic field and explain how the resultant force relates to circular motion in field problems.

What this helps you practise:

Drawing accurate free-body diagrams for various scenarios

How to use it well:

Free-body diagrams are the starting point for all force analysis — practise until drawing them

becomes automatic before attempting Newton's law calculations.

Prompt 15: Newton's Second Law Problems

Copy this prompt into your AI tool:

Prepare a multi-body system such as connected masses on a pulley or an object on an inclined plane with friction. Ask me to draw free-body diagrams, apply Newton's second law to each body, and solve the resulting equations simultaneously for acceleration and tension. Verify my force identification at each step.

What this helps you practise:

Applying Newton's second law to connected body systems

How to use it well:

Connected body problems are a classic Paper 2 question type — use this prompt to master the systematic approach of isolating each body and applying F = ma.

Prompt 16: Projectile Motion Analysis

Copy this prompt into your AI tool:

Pose a projectile motion problem and ask me to resolve the initial velocity into horizontal and vertical components, apply kinematic equations independently to each direction, and find the range, maximum height, and time of flight. Then ask me to explain why air resistance would affect horizontal and vertical motion differently.

What this helps you practise:

Analysing projectile motion using component resolution

How to use it well:

Practise treating horizontal and vertical motion independently — this separation of components is

the key concept that makes projectile problems manageable.

Prompt 17: Work, Energy, and Power Calculations

Copy this prompt into your AI tool:

Put forward scenarios involving work done by forces at various angles, changes in kinetic and gravitational potential energy, and power output. For each, ask me to identify the energy transformations, apply the work-energy theorem, and calculate the required quantities. Include a scenario involving efficiency. At HL, extend your answer to include gravitational potential energy using the field equation E_p = -GMm/r and explain when the simplified mgh approximation breaks down.

What this helps you practise:

Calculating work, energy transformations, and power in physical systems

How to use it well:

Energy methods often provide elegant alternatives to force-based solutions — practise recognising when energy conservation simplifies a mechanics problem.

Prompt 18: Conservation of Momentum

Copy this prompt into your AI tool:

Pose collision and explosion problems and ask me to apply conservation of momentum. Include an elastic collision where I must also apply conservation of kinetic energy. Ask me to classify each interaction as elastic, inelastic, or perfectly inelastic and justify my classification with calculations. Address a TOK knowledge question: To what extent do the laws of thermodynamics constitute discovered truths about nature, or are they human constructs imposed on observed regularities?

What this helps you practise:
Applying momentum conservation to collisions and explosions
How to use it well:
Momentum questions frequently appear on Paper 2 — practise setting up the conservation equation correctly with attention to direction and sign conventions. This also builds TOK connections for your exhibition or essay.

Prompt 19: Impulse and Force-Time Graphs
Copy this prompt into your AI tool:
Give me force-time graphs for different impacts and ask me to calculate the impulse from the area under each graph. Then ask me to relate impulse to change in momentum and determine the average force during impact. Include a question about why crumple zones reduce injury.
What this helps you practise:
Relating impulse to momentum change using force-time graphs
How to use it well:
This prompt connects the graphical and algebraic representations of impulse, building the flexible understanding that IB examiners test across both papers.

Prompt 20: Friction and Inclined Planes
Copy this prompt into your AI tool:
Introduce an object on an inclined plane with friction and ask me to resolve forces parallel and perpendicular to the plane. Then ask me to determine whether the object accelerates or remains stationary, calculate the friction force, and find the acceleration if applicable. Vary the angle and coefficient of friction. SL students focus on force resolution and Newton's second law, while HL

students should also analyse how this scenario changes when the object is a charged body on an inclined plane within an electric field.

What this helps you practise:

Analysing forces on inclined planes with friction

How to use it well:

Inclined plane problems combine force resolution with Newton's laws — practise resolving components along the plane until the approach feels natural.

Prompt 21: Energy Conservation with Dissipation

Copy this prompt into your AI tool:

Set me a challenge: analyse a scenario where mechanical energy is not conserved, such as a block sliding down a rough surface or a pendulum losing energy. Ask me to calculate the initial and final mechanical energies, determine the energy dissipated as thermal energy, and explain the physical mechanism of dissipation.

What this helps you practise:

Accounting for energy dissipation in non-ideal systems

How to use it well:

Real systems lose energy — this prompt prepares you for the contextual questions where energy conservation must be modified to account for friction or drag.

Prompt 22: Mechanics Exam Question Synthesis

Copy this prompt into your AI tool:

Create an extended Paper 2 style question that integrates kinematics, forces, and energy in a single scenario — such as a roller coaster or a vehicle on a hill. Include parts requiring free-body diagrams, Newton's law application, energy conservation, and

discussion of assumptions. Mark my response using IB mark scheme conventions.

What this helps you practise:

Completing multi-concept mechanics exam questions under IB conditions

How to use it well:

Extended mechanics questions test your ability to connect different concepts — use this prompt to practise transitioning between force and energy approaches within one problem.

Prompt 23: Terminal Velocity and Drag Forces

Copy this prompt into your AI tool:

Construct a scenario involving a falling object experiencing air resistance and ask me to describe qualitatively how the velocity changes over time. Then quiz me on drawing the velocity-time graph, explaining why terminal velocity is reached, and identifying the condition on forces at terminal velocity.

What this helps you practise:

Analysing motion with velocity-dependent resistive forces

How to use it well:

Terminal velocity questions test qualitative understanding of changing net force — practise explaining the physics in clear sentences as well as with equations.

Section 3

Thermal Physics

Thermal physics in IB covers the kinetic molecular theory of matter, heat transfer, phase changes, and the ideal gas model. Understanding the distinction between internal energy, temperature, and heat is fundamental to this topic.

You must be able to apply the ideal gas law, explain gas behaviour using the kinetic model, and solve problems involving specific heat capacity, latent heat, and thermal equilibrium. The Data Booklet provides key constants and formulae for gas calculations.

These prompts build your ability to connect microscopic molecular behaviour to macroscopic thermal properties, a conceptual link that IB Physics examiners frequently test through explanation questions worth significant marks.

Prompt 24: Temperature and Internal Energy Concepts

Copy this prompt into your AI tool:

Ask me to define temperature, internal energy, and heat in IB Physics terms and explain how they differ. Then present three scenarios and ask me to determine whether internal energy, temperature, or both change in each case. Include a phase change scenario where temperature remains constant.

What this helps you practise:

Distinguishing between temperature, internal energy, and heat

How to use it well:

These definitions are frequently tested on Paper 1 —

use this prompt to develop precise explanations that match the IB command term 'define'.

Prompt 25: Specific Heat Capacity Calculations

Copy this prompt into your AI tool:

Outline three thermal equilibrium problems where substances at different temperatures are mixed. Ask me to set up the heat exchange equation, solve for the unknown quantity, and explain the assumptions I have made. Include one problem involving a phase change during mixing.

What this helps you practise:

Solving thermal equilibrium problems using specific heat capacity

How to use it well:

Practise setting up the equation Q(lost) = Q(gained) systematically, as errors in sign convention are the most common source of mistakes in these calculations.

Prompt 26: Latent Heat and Phase Changes

Copy this prompt into your AI tool:

Pose a heating curve showing temperature versus energy added for a substance passing through multiple phase changes. Ask me to identify each phase and transition, explain why temperature plateaus occur during phase changes, and calculate the energy required for a specific transition.

What this helps you practise:

Interpreting heating curves and calculating latent heat

How to use it well:

This prompt connects the graphical representation of phase changes to the underlying physics, building the conceptual understanding tested on both Paper 1 and Paper 2.

Prompt 27: Ideal Gas Law Applications

Copy this prompt into your AI tool:

Challenge four problems requiring application of the ideal gas law pV = nRT. Include problems involving changes in pressure, volume, and temperature, as well as one requiring calculation of the number of moles. After each solution, ask me to verify using the Data Booklet value for R. Consider how you could design an IA experiment to test this relationship, identifying independent, dependent, and controlled variables.

What this helps you practise:

Applying the ideal gas law to calculate gas properties

How to use it well:

Practise unit consistency when applying the gas law — ensure pressure is in pascals, volume in cubic metres, and temperature in kelvin every time. This also helps develop your IA planning skills.

Prompt 28: Kinetic Molecular Theory Explanations

Copy this prompt into your AI tool:

Ask me to use the kinetic molecular theory to explain five macroscopic gas properties: pressure, temperature, the gas laws, diffusion, and Brownian motion. For each explanation, evaluate whether I correctly link molecular behaviour to observable phenomena using appropriate IB terminology.

What this helps you practise:

Explaining gas behaviour using the kinetic molecular theory

How to use it well:

Explanation questions are worth significant marks on Paper 2 — practise constructing logical chains from molecular motion to macroscopic properties.

Prompt 29: Gas Law Problem Solving

Copy this prompt into your AI tool:

Frame problems involving Boyle's law, Charles's law, and Gay-Lussac's law separately, then give a combined gas law problem. For each, ask me to identify which variables are constant, apply the appropriate relationship, and express my answer with correct units. Include a graphical interpretation question.

What this helps you practise:

Applying individual and combined gas laws to solve problems

How to use it well:

Use this prompt to reinforce the conditions under which each gas law applies and to practise the graphical representations of gas law relationships.

Prompt 30: Molecular Speed and Energy Distribution

Copy this prompt into your AI tool:

Show me a Maxwell-Boltzmann distribution curve and ask me to describe its key features. Then ask me to predict how the distribution changes with increasing temperature and to explain why not all molecules at the same temperature have the same speed. Connect this to the concept of average kinetic energy.

What this helps you practise:

Interpreting and explaining molecular speed distributions

How to use it well:

This conceptual topic appears on Paper 1 — practise describing the distribution shape and its temperature dependence in precise physical language.

Prompt 31: Heat Transfer Mechanisms

Copy this prompt into your AI tool:

Give me a practical scenario such as a thermos flask or a heated building and ask me to identify and explain all heat transfer mechanisms present: conduction, convection, and radiation. Then challenge me to evaluate which mechanism is dominant and how each could be reduced.

What this helps you practise:

Identifying and explaining heat transfer mechanisms in context

How to use it well:

Heat transfer understanding connects to real-world applications and experimental design — use this prompt to build explanations that reference molecular behaviour.

Prompt 32: Thermal Physics Conceptual Questions

Copy this prompt into your AI tool:

Show five true-or-false statements about thermal physics concepts and ask me to evaluate each. For any false statement, ask me to correct it and explain the misconception. Include common errors about temperature during phase changes, the meaning of internal energy, and the behaviour of ideal gases.

What this helps you practise:

Identifying and correcting common thermal physics misconceptions

How to use it well:

Paper 1 multiple choice questions often target common misconceptions — use this prompt to identify and correct any misunderstandings before the exam.

Prompt 33: First Law of Thermodynamics

Copy this prompt into your AI tool:

Pose three thermodynamic processes — isothermal, isobaric, and adiabatic — and ask me to apply the first law of thermodynamics to each. For each process, ask me to determine the signs of work done, heat transferred, and change in internal energy. Include a pressure-volume diagram interpretation.

What this helps you practise:

Applying the first law of thermodynamics to different processes

How to use it well:

Understanding energy transfer in thermodynamic processes is essential for HL — practise tracking the flow of energy using consistent sign conventions.

Prompt 34: Thermal Physics Exam Question Synthesis

Copy this prompt into your AI tool:

Create an IB Paper 2 style structured question that combines calorimetry calculations with gas law applications and kinetic theory explanations. Include a data-processing component where I must determine a thermal property from experimental measurements. Mark my response against IB standards.

What this helps you practise:

Completing multi-part thermal physics exam questions

How to use it well:

Use this extended question to practise moving between calculation and explanation within a single thermal physics context, as Paper 2 questions demand.

Section 4

Waves

Waves is a core topic that covers oscillations, travelling waves, wave characteristics, standing waves, and the Doppler effect. Understanding wave phenomena requires both mathematical description and physical intuition about how energy propagates through media.

You must be able to describe waves using key parameters — wavelength, frequency, amplitude, period, and wave speed — and understand the superposition principle that governs interference and standing wave formation. HL students extend this to single-slit diffraction, double-slit interference, and resolution.

These prompts develop your ability to analyse wave behaviour quantitatively and qualitatively, connecting mathematical descriptions to observable phenomena such as sound, light, and water waves.

Prompt 35: Wave Parameter Calculations

Copy this prompt into your AI tool:

Assemble five wave descriptions with various combinations of given parameters and ask me to calculate the missing quantities using $v = f\lambda$ and $T = 1/f$. Include electromagnetic waves, sound waves, and water waves. After each, ask me to check whether my answer is physically reasonable for that wave type. At HL, extend your answer to include the Doppler effect for moving sources and observers, and calculate the observed frequency shift for one of the wave scenarios.

What this helps you practise:

Calculating wave speed, frequency, wavelength, and period

How to use it well:

Build automatic recall of the wave equation and period-frequency relationship, as these appear throughout the waves topic and beyond.

Prompt 36: Transverse vs Longitudinal Waves

Copy this prompt into your AI tool:

Ask me to define and compare transverse and longitudinal waves, giving two examples of each. Then describe a wave scenario and ask me to classify it, identify the direction of oscillation relative to energy transfer, and explain whether the wave can be polarised.

What this helps you practise:

Distinguishing between transverse and longitudinal wave types

How to use it well:

This fundamental classification is tested on Paper 1 — practise precise definitions that reference the relationship between oscillation and propagation directions.

Prompt 37: Superposition and Interference

Copy this prompt into your AI tool:

Build two wave pulses approaching each other and ask me to sketch the resultant wave at the moment they overlap. Then extend to continuous waves: ask me to determine conditions for constructive and destructive interference, calculate path differences, and predict the interference pattern.

What this helps you practise:

Applying the superposition principle to predict interference patterns

How to use it well:

Understanding superposition is foundational for standing waves and diffraction — use this prompt to develop visual and mathematical intuition for wave combination.

Prompt 38: Standing Wave Analysis

Copy this prompt into your AI tool:

You are an IB examiner. Present me with a standing wave on a string fixed at both ends and ask me to identify nodes, antinodes, and the harmonic number. Then quiz me on calculating the frequency of the first three harmonics given the string length and wave speed. Extend to standing waves in open and closed pipes. SL students focus on identifying harmonics and applying boundary conditions, while HL students should also analyse how standing wave patterns relate to the quantised energy levels in the Bohr model of the atom. Connect this to TOK: Discuss whether the wave-particle duality of light reveals a fundamental limitation of human perception and language in describing physical reality.

What this helps you practise:

Analysing standing wave patterns and calculating harmonic frequencies

How to use it well:

Standing waves in strings and pipes are a classic exam topic — practise sketching the displacement patterns and applying the boundary conditions for each case. This also builds TOK connections for your exhibition or essay.

Prompt 39: Doppler Effect Calculations

Copy this prompt into your AI tool:

Devise three Doppler effect scenarios: a source moving towards a stationary observer, an observer

moving towards a stationary source, and both moving. For each, ask me to predict whether the observed frequency increases or decreases, then calculate the observed frequency using the Data Booklet formula.

What this helps you practise:

Calculating observed frequencies using the Doppler effect equation

How to use it well:

Practise with the Doppler formula from the Data Booklet to ensure correct sign usage and substitution, which is where most errors occur in this topic.

Prompt 40: Wave Intensity and Amplitude

Copy this prompt into your AI tool:

Ask me to explain the relationship between wave intensity and amplitude, and between intensity and distance from a point source. Then pose problems requiring me to calculate how intensity or amplitude changes at different distances. Include a problem involving the decibel scale.

What this helps you practise:

Relating wave intensity to amplitude and distance

How to use it well:

Intensity relationships underpin understanding of wave energy transfer — use this prompt to master the inverse square law and its applications.

Prompt 41: Reflection, Refraction, and Snell's Law

Copy this prompt into your AI tool:

Formulate a light ray incident on a boundary between two media and ask me to apply Snell's law to find the refracted angle. Then ask me to determine the critical angle and conditions for total

internal reflection. Include a practical application such as optical fibres.

What this helps you practise:

Applying Snell's law and understanding total internal reflection

How to use it well:

Snell's law calculations are straightforward but require careful angle measurement — practise identifying the correct angles from diagrams to avoid errors.

Prompt 42: Diffraction and Resolution

Copy this prompt into your AI tool:

Ask me to analyse single-slit diffraction and test whether I can explain how the diffraction pattern depends on slit width and wavelength. Then introduce the Rayleigh criterion and challenge me to calculate the minimum resolvable angle for a given aperture. Ask me to explain the practical significance in telescopes or microscopes.

What this helps you practise:

Analysing diffraction patterns and applying the resolution criterion

How to use it well:

HL students should use this prompt to connect the mathematics of diffraction to its practical consequences for optical instruments and imaging.

Prompt 43: Double-Slit Interference Pattern

Copy this prompt into your AI tool:

Compose a double-slit experiment and ask me to derive the conditions for bright and dark fringes. Then ask me to calculate the fringe spacing given slit separation, wavelength, and screen distance. Ask me to predict how changing each variable affects the pattern.

What this helps you practise:

Calculating and predicting double-slit interference patterns

How to use it well:

HL students encounter Young's double-slit experiment frequently — practise the calculation and the qualitative predictions about fringe spacing changes.

Prompt 44: Polarisation of Waves

Copy this prompt into your AI tool:

Ask me to explain what polarisation is and why only transverse waves can be polarised. Then present Malus's law and ask me to calculate transmitted intensity through one and two polarising filters. Include an application question about polarising sunglasses or LCD screens.

What this helps you practise:

Understanding polarisation and applying Malus's law

How to use it well:

Polarisation connects wave theory to everyday applications — use this prompt to develop both the mathematical and conceptual understanding required for exam responses.

Prompt 45: Waves Exam Question Synthesis

Copy this prompt into your AI tool:

Construct an IB Paper 2 structured question that combines wave fundamentals with standing waves or interference in a practical context. Include a diagram to interpret, calculations to perform, and an explanation to write. Mark my response and identify where I demonstrate or lack understanding.

What this helps you practise:

Completing extended wave phenomena exam questions

How to use it well:
Use this as a comprehensive practice question that tests your ability to integrate different wave concepts within a single physical scenario.

Section 5

Electricity and Magnetism

Electricity and magnetism covers electric charge, fields, circuits, and the magnetic effects of currents. This topic requires both conceptual understanding of field theory and practical circuit analysis skills, with significant overlap between Paper 1 and Paper 2 question types.

At SL, you must master Ohm's law, series and parallel circuit analysis, and the concepts of electric potential and field strength. HL extends to capacitance, electromagnetic induction, Faraday's law, and Lenz's law, connecting electricity to magnetism through the concept of changing flux.

These prompts develop your ability to analyse circuits systematically, interpret field diagrams, and solve multi-step electricity problems that combine theoretical understanding with quantitative calculation.

Prompt 46: Electric Field Concepts

Copy this prompt into your AI tool:

Ask me to define electric field strength and explain how electric field lines represent the field around point charges and parallel plates. Then present charge configurations and ask me to sketch the field patterns, determine the field strength at specific points, and explain the direction of force on a test charge.

What this helps you practise:

Describing and calculating electric fields for different configurations

How to use it well:

Field line diagrams must be drawn with care —

practise until you can produce accurate sketches that reflect field strength through line density and direction.

Prompt 47: Coulomb's Law Calculations

Copy this prompt into your AI tool:

Present problems involving two or three point charges and ask me to calculate the force between them using Coulomb's law from the Data Booklet. For three charges, ask me to find the net force on one charge by vector addition. Include a problem where I must find the equilibrium position for a third charge.

What this helps you practise:

Applying Coulomb's law to calculate electrostatic forces

How to use it well:

Practise vector addition of electric forces, as problems with more than two charges require careful component resolution and attention to direction.

Prompt 48: Series and Parallel Circuit Analysis

Copy this prompt into your AI tool:

Pose a circuit containing resistors in series and parallel combinations with a battery. Ask me to calculate the total resistance, current through each resistor, and potential difference across each component. Then ask me to verify my answers using Kirchhoff's laws.

What this helps you practise:

Analysing combination series-parallel circuits systematically

How to use it well:

Circuit analysis is one of the most frequently examined topics — develop a systematic approach of simplifying the circuit step by step to avoid errors.

Prompt 49: Kirchhoff's Laws Application

Copy this prompt into your AI tool:

Present a circuit with two or more loops and ask me to apply Kirchhoff's junction and loop rules to set up simultaneous equations. Then ask me to solve for the unknown currents and verify that energy conservation is satisfied around each loop. Assess my sign conventions.

What this helps you practise:

Applying Kirchhoff's laws to multi-loop circuits

How to use it well:

Kirchhoff's laws extend circuit analysis beyond simple series-parallel combinations — practise setting up loop equations with consistent sign conventions.

Prompt 50: Internal Resistance and EMF

Copy this prompt into your AI tool:

Set up a circuit with a battery of known EMF and internal resistance connected to an external load. Ask me to calculate the terminal potential difference, current, and power delivered to the load. Then challenge me to determine the load resistance that maximises power transfer.

What this helps you practise:

Solving problems involving EMF and internal resistance

How to use it well:

Internal resistance questions are a Paper 2 favourite — practise distinguishing between EMF and terminal voltage, which many students confuse.

Prompt 51: Electrical Power and Energy

Copy this prompt into your AI tool:

Pose problems requiring calculation of electrical power using $P = IV$, $P = I^2R$, and $P = V^2/R$. Include a

real-world context such as household appliances or transmission lines. Ask me to calculate energy consumed over a time period and to explain why high-voltage transmission reduces power losses. Suggest how this concept could form the basis of a Physics IA investigation, including appropriate data collection methods and uncertainty analysis.

What this helps you practise:

Calculating electrical power and energy in practical contexts

How to use it well:

Power calculations appear in applied contexts on Paper 2 — practise selecting the most efficient power formula based on the quantities given in the problem. This also helps develop your IA planning skills.

Prompt 52: Magnetic Force on Charges and Currents

Copy this prompt into your AI tool:

Present scenarios involving charged particles moving in magnetic fields and current-carrying conductors in magnetic fields. Ask me to determine the direction and magnitude of the magnetic force using the right-hand rule and the formula $F = qvB \sin \theta$. Include a circular motion application.

What this helps you practise:

Calculating magnetic forces on charges and current-carrying conductors

How to use it well:

Practise the right-hand rule systematically until determining force direction becomes automatic, as it is tested through diagrams on both Paper 1 and Paper 2.

Prompt 53: Electromagnetic Induction

Copy this prompt into your AI tool:

Pose scenarios involving changing magnetic flux — a coil entering a field, a magnet moving through a solenoid, a rotating loop. For each, ask me to apply Faraday's law to calculate the induced EMF and Lenz's law to determine its direction. Quiz me on the energy conservation principle underlying Lenz's law.

What this helps you practise:

Applying Faraday's and Lenz's laws to electromagnetic induction problems

How to use it well:

HL students should practise identifying the source of changing flux in each scenario, as this is the key step that determines the correct application of Faraday's law.

Prompt 54: Capacitance and RC Circuits

Copy this prompt into your AI tool:

Present problems involving parallel plate capacitors: calculating capacitance, charge, energy stored, and the effect of inserting a dielectric. Then describe a charging or discharging RC circuit and ask me to sketch the voltage and current graphs and explain the exponential behaviour.

What this helps you practise:

Analysing capacitor behaviour and RC circuit characteristics

How to use it well:

HL students should use this prompt to understand both the steady-state and transient behaviour of capacitors, connecting the mathematics to the physical charging process.

Prompt 55: Potential Divider Circuits

Copy this prompt into your AI tool:

Pose a potential divider circuit and ask me to calculate the output voltage. Then modify the circuit by adding a sensor (thermistor or LDR) and ask me

to explain how the output voltage changes with environmental conditions. Include a design question where I must choose resistor values for a specific application.

What this helps you practise:

Analysing and designing potential divider circuits with sensors

How to use it well:

Potential dividers combine circuit analysis with practical applications — use this prompt to develop both the calculation skills and the design thinking tested in Paper 2.

Prompt 56: Electricity Exam Question Synthesis

Copy this prompt into your AI tool:

Create an extended Paper 2 question that combines circuit analysis with electric field concepts or electromagnetic induction in a practical context. Include calculation, explanation, and evaluation components. Mark my response using IB conventions and identify areas for improvement.

What this helps you practise:

Completing multi-part electricity and magnetism exam questions

How to use it well:

Use this as a full practice question to develop the ability to connect electrical theory with practical circuit behaviour in extended exam responses.

Section 6

Circular Motion and Gravitation

Circular motion and gravitation connect the mechanics of rotating objects to the universal gravitational force that governs planetary motion. Understanding centripetal acceleration and the forces that produce it is essential for analysing orbits, banked curves, and rotating systems.

You must be able to apply Newton's law of gravitation, calculate gravitational field strength, and analyse uniform circular motion quantitatively. HL students extend this to gravitational potential, orbital mechanics, and escape velocity.

These prompts develop your ability to identify the centripetal force in different physical situations and apply gravitational concepts to astronomical and everyday contexts.

Prompt 57: Centripetal Acceleration and Force

Copy this prompt into your AI tool:

Present five scenarios involving circular motion — a car on a curve, a ball on a string, a satellite in orbit, a roller coaster loop, and a centrifuge — and ask me to identify the centripetal force in each case. Then ask me to calculate the centripetal acceleration and the required force for one scenario.

What this helps you practise:

Identifying centripetal forces and calculating centripetal acceleration

How to use it well:

The most important skill in circular motion is identifying what provides the centripetal force — practise this identification step before attempting calculations.

Prompt 58: Newton's Law of Gravitation

Copy this prompt into your AI tool:

Pose problems requiring application of Newton's law of universal gravitation to calculate gravitational forces between masses. Include a problem involving the gravitational force at different altitudes above Earth and one comparing gravitational forces on different planets using Data Booklet values.

What this helps you practise:

Applying Newton's gravitational law to calculate forces between masses

How to use it well:

Use this prompt with Data Booklet values for planetary masses and radii to practise the calculations that appear in astronomical context questions.

Prompt 59: Gravitational Field Strength

Copy this prompt into your AI tool:

Ask me to calculate gravitational field strength at the surface of different celestial bodies and at various heights above Earth. Then ask me to explain the relationship between gravitational field strength and free-fall acceleration. Include a graphical question about how g varies with distance from a planet's centre. Link this to a TOK discussion: Evaluate the role of imagination and intuition as ways of knowing in Einstein's development of special relativity, contrasting this with purely empirical methods.

What this helps you practise:

Calculating and interpreting gravitational field strength

How to use it well:

Practise connecting the concept of field strength to the practical measurement of free-fall acceleration,

which IB examiners test through explanation questions. This also builds TOK connections for your exhibition or essay.

Prompt 60: Orbital Mechanics

Copy this prompt into your AI tool:

Present a satellite in circular orbit and ask me to derive the relationship between orbital speed, radius, and the mass of the central body. Then ask me to calculate the orbital period and speed for a satellite at a given altitude. Extend by asking me to explain the concept of geostationary orbits.

What this helps you practise:

Analysing satellite orbits using gravitational and circular motion concepts

How to use it well:

Orbital problems combine gravitation with circular motion — practise setting gravitational force equal to centripetal force, which is the key equation for all orbit calculations.

Prompt 61: Gravitational Potential and Energy

Copy this prompt into your AI tool:

Ask me to define gravitational potential and gravitational potential energy, distinguishing between the two. Then pose problems requiring calculation of escape velocity and the energy required to move a mass between two points in a gravitational field. Include a question about why gravitational potential is always negative.

What this helps you practise:

Calculating gravitational potential energy and escape velocity

How to use it well:

HL students should use this prompt to master the sign conventions for gravitational potential energy

and understand the physical meaning of zero potential at infinity.

Prompt 62: Banked Curves and Vertical Circles

Copy this prompt into your AI tool:

Present a car on a frictionless banked curve and ask me to analyse the forces to find the required banking angle. Then present an object moving in a vertical circle and ask me to determine the minimum speed at the top to maintain contact. Compare the forces at the top and bottom of the circle.

What this helps you practise:

Analysing forces in banked curves and vertical circular motion

How to use it well:

These scenarios require careful free-body diagrams and force resolution — practise drawing the diagrams before writing any equations.

Prompt 63: Kepler's Laws and Orbital Periods

Copy this prompt into your AI tool:

Pose Kepler's three laws and ask me to apply the third law to calculate unknown orbital periods or radii given data for one planet. Then ask me to verify the law using Data Booklet values for two planets in our solar system. Explain how Kepler's third law relates to Newton's gravitational law.

What this helps you practise:

Applying Kepler's laws to planetary and satellite orbital calculations

How to use it well:

Kepler's third law provides an elegant method for comparing orbits — practise setting up the ratio equation that eliminates the need for knowing central body mass.

Prompt 64: Apparent Weightlessness and g-Forces

Copy this prompt into your AI tool:

Ask me to explain why astronauts in orbit appear weightless despite being subject to gravitational force. Then present scenarios involving lifts, aircraft manoeuvres, and fairground rides and ask me to calculate the apparent weight or normal force in each case. Connect to the concept of g-forces.

What this helps you practise:

Explaining apparent weightlessness and calculating apparent weight

How to use it well:

Apparent weight problems are excellent for testing understanding of Newton's laws in non-inertial frames — practise explaining the physics as well as calculating.

Prompt 65: Gravitational Field Strength Variation

Copy this prompt into your AI tool:

Present a graph showing how gravitational field strength varies with distance from the centre of a planet, both inside and outside its surface. Ask me to explain the shape of the graph in each region and to calculate field strength at specific distances using Data Booklet values. Include a question about the field between two massive bodies.

What this helps you practise:

Analysing how gravitational field strength varies with position

How to use it well:

HL students should practise interpreting field strength graphs and explaining the physics behind the linear increase inside and inverse-square decrease outside a uniform sphere.

Prompt 66: Weightlessness in Free Fall and Orbits

Copy this prompt into your AI tool:

Pose three scenarios — a person in a falling lift, an astronaut on the International Space Station, and a ball thrown vertically upward at its peak — and ask me to analyse the forces acting and explain the state of apparent weightlessness in each. Then ask me to calculate the orbital speed required for a satellite at a given altitude.

What this helps you practise:

Distinguishing true weightlessness from apparent weightlessness

How to use it well:

Practise explaining that orbital weightlessness results from continuous free fall, not absence of gravity — a common misconception tested on Paper 1.

Prompt 67: Circular Motion and Gravitation Exam Practice

Copy this prompt into your AI tool:

Create an IB Paper 2 style question combining circular motion with gravitational concepts in a satellite or planetary context. Include a derivation, numerical calculations using Data Booklet values, and a discussion question about the assumptions of the model used. Mark my response against IB standards.

What this helps you practise:

Completing integrated circular motion and gravitation exam questions

How to use it well:

Use this as a comprehensive practice question that requires you to combine gravitational theory with circular motion analysis in a realistic context.

Section 7

Atomic, Nuclear, and Particle Physics

This topic covers the structure of atoms, nuclear processes, and the fundamental particles that constitute matter. It progresses from atomic energy levels and emission spectra through radioactive decay to nuclear fission, fusion, and the Standard Model of particle physics.

You must understand discrete energy levels and photon emission, calculate nuclear binding energy and mass defect, and analyse radioactive decay using half-life. HL students extend to the classification of particles by quarks, leptons, and exchange bosons.

These prompts build your understanding of the subatomic world, connecting quantum concepts to observable phenomena and developing the analytical skills needed for both calculation and explanation questions.

Prompt 68: Atomic Energy Levels and Spectra

Copy this prompt into your AI tool:

Present an energy level diagram for hydrogen and ask me to calculate the wavelengths of photons emitted during specific transitions. Then ask me to explain why atomic spectra are discrete and how emission and absorption spectra differ. Include a question about using spectra to identify elements.

What this helps you practise:

Calculating photon energies from energy level transitions

How to use it well:

Use this prompt to connect the abstract concept of

quantised energy levels to the practical observation of spectral lines, a link frequently tested on Paper 1.

Prompt 69: Radioactive Decay Types

Copy this prompt into your AI tool:

Pose five nuclear equations with missing products and ask me to complete each by identifying the type of decay (alpha, beta-minus, beta-plus, or gamma) and applying conservation of mass number and atomic number. Then ask me to compare the properties of each radiation type.

What this helps you practise:

Identifying decay types and balancing nuclear equations

How to use it well:

Nuclear equations must balance in both mass number and atomic number — practise until this conservation check becomes automatic.

Prompt 70: Half-Life Calculations

Copy this prompt into your AI tool:

Challenge problems involving radioactive decay: calculating remaining activity or mass after several half-lives, determining the half-life from decay data, and predicting the time for activity to fall to a given fraction. Include a graphical interpretation problem using a decay curve.

What this helps you practise:

Calculating quantities using the half-life concept

How to use it well:

Half-life problems appear in both calculation and graphical form — practise both approaches and ensure you can extract half-life values from exponential decay graphs.

Prompt 71: Mass Defect and Binding Energy

Copy this prompt into your AI tool:

Give me the masses of a nucleus and its constituent nucleons and ask me to calculate the mass defect and binding energy using $E = mc^2$. Then ask me to calculate the binding energy per nucleon and explain its significance for nuclear stability. Include a comparison between different nuclei.

What this helps you practise:

Calculating mass defect and nuclear binding energy

How to use it well:

Use Data Booklet values for atomic masses to practise these calculations, paying careful attention to unit conversions between atomic mass units and energy.

Prompt 72: Nuclear Fission and Fusion

Copy this prompt into your AI tool:

Ask me to explain the processes of nuclear fission and fusion, including why each releases energy by reference to the binding energy per nucleon curve. Then present a fission or fusion reaction and ask me to calculate the energy released. Include a question about the conditions required for fusion.

What this helps you practise:

Explaining and calculating energy release in nuclear reactions

How to use it well:

The binding energy per nucleon curve is central to explaining both fission and fusion — practise using it to justify why energy is released in each process.

Prompt 73: The Standard Model of Particles

Copy this prompt into your AI tool:

Test me to classify the fundamental particles into quarks, leptons, and exchange bosons. Then present particle interactions and ask me to identify the exchange particle involved and draw a Feynman diagram for each. Include questions about

conservation of baryon number, lepton number, and charge.

What this helps you practise:

Classifying particles and applying conservation laws in interactions

How to use it well:

HL students should use this prompt to build familiarity with the Standard Model classification and the conservation laws that govern particle interactions.

Prompt 74: Quark Model and Hadron Structure

Copy this prompt into your AI tool:

Present a list of hadrons and ask me to determine the quark composition of each. Then ask me to use quark properties to calculate the charge, baryon number, and strangeness of each hadron. Include mesons and baryons, and ask me to explain the difference between the two.

What this helps you practise:

Determining quark compositions and properties of hadrons

How to use it well:

HL students should practise using the Data Booklet quark properties to build up hadron characteristics — this systematic approach prevents errors on Paper 1.

Prompt 75: Photoelectric Effect

Copy this prompt into your AI tool:

You are an IB examiner. Set up a photoelectric effect experiment scenario and ask me to explain the observations that classical wave theory cannot account for. Then challenge me to apply Einstein's photoelectric equation to calculate threshold frequency, maximum kinetic energy, and stopping voltage. Include a graphical analysis question.

What this helps you practise:

Explaining and applying the photoelectric effect quantitatively

How to use it well:

The photoelectric effect bridges classical and quantum physics — practise explaining why it requires photon theory, as this conceptual question appears frequently.

Prompt 76: Matter Waves and de Broglie

Copy this prompt into your AI tool:

Ask me to calculate the de Broglie wavelength of particles with different momenta, including electrons, protons, and macroscopic objects. Then ask me to explain why wave behaviour is observable for electrons but not for baseballs, and discuss the evidence for wave-particle duality.

What this helps you practise:

Calculating de Broglie wavelengths and explaining wave-particle duality

How to use it well:

Use this prompt to connect the mathematical formula to the physical concept, ensuring you can explain why quantum effects dominate at the atomic scale.

Prompt 77: Nuclear Physics Exam Question Synthesis

Copy this prompt into your AI tool:

Create an IB Paper 2 style question that combines radioactive decay calculations with nuclear energy concepts. Include a decay equation to complete, a half-life calculation, a binding energy analysis, and a discussion of the social implications of nuclear technology. Mark my response against IB standards.

What this helps you practise:

Completing multi-part nuclear physics exam questions

How to use it well:

Extended nuclear physics questions often include a social or ethical discussion component — practise providing balanced, evidence-based responses for these marks.

Prompt 78: Nuclear Reactions and Conservation Laws

Copy this prompt into your AI tool:

Present four nuclear reactions and ask me to verify conservation of mass number, atomic number, charge, and energy in each. Then present a reaction with a missing particle and ask me to identify it using conservation laws. Include one reaction that violates a conservation law and ask me to identify the error.

What this helps you practise:

Verifying and applying conservation laws in nuclear reactions

How to use it well:

Conservation laws are the primary tool for analysing nuclear reactions — practise checking every reaction for consistency before attempting energy calculations.

Section 8

Energy Production and Wave Phenomena

This section combines the study of energy sources and their environmental impacts with advanced wave phenomena including interference, diffraction, and resolution at HL. Understanding global energy challenges and the physics of renewable and non-renewable sources is an important part of the IB Physics course.

Energy production topics include thermal power generation, nuclear power, solar energy, wind energy, and hydroelectric power, along with analysis of efficiency, energy density, and environmental impact. HL wave phenomena extend the core waves topic to include detailed analysis of interference patterns and optical resolution.

These prompts develop both your quantitative analysis of energy systems and your ability to evaluate energy solutions critically, a skill that IB examiners assess through discussion and evaluation questions.

Prompt 79: Energy Sources Comparison

Copy this prompt into your AI tool:

Ask me to compare four energy sources — fossil fuels, nuclear, solar, and wind — in terms of energy density, efficiency, reliability, and environmental impact. For each comparison, require me to use specific data and physics principles. Then ask me to evaluate which combination would best serve a specific country's needs.

What this helps you practise:

Comparing energy sources using quantitative and qualitative criteria

How to use it well:

Energy source comparison questions appear on Paper 2 — practise providing balanced evaluations that reference specific physical quantities and environmental factors.

Prompt 80: Thermal Power Station Efficiency

Copy this prompt into your AI tool:

Give me data about a thermal power station and ask me to draw a Sankey diagram showing energy transformations. Then provide numerical data and challenge me to calculate the overall efficiency and identify where the greatest energy losses occur. Ask me to suggest and evaluate improvements.

What this helps you practise:

Analysing efficiency and energy losses in thermal power generation

How to use it well:

Sankey diagrams and efficiency calculations are standard Paper 2 questions — practise drawing proportional diagrams and interpreting energy flow quantitatively.

Prompt 81: Solar Power Calculations

Copy this prompt into your AI tool:

Present data about solar radiation intensity and solar panel specifications. Ask me to calculate the power output, accounting for panel area, efficiency, and the angle of incidence of sunlight. Then ask me to determine the number of panels needed to meet a specific energy demand and discuss practical limitations.

What this helps you practise:

Calculating solar power output and evaluating practical feasibility

How to use it well:

Solar power calculations require careful attention to

the distinction between power and energy — practise converting between these and accounting for daily variation.

Prompt 82: Greenhouse Effect and Climate Physics

Copy this prompt into your AI tool:

Test whether I can outline and analyse the greenhouse effect using the concepts of radiation absorption and re-emission by atmospheric gases. Then present data on global temperature changes and ask me to discuss the evidence for anthropogenic climate change. Include a question about the Stefan-Boltzmann law applied to Earth's energy balance.

What this helps you practise:

Explaining the physics of the greenhouse effect and climate change

How to use it well:

Climate physics questions require both scientific explanation and critical evaluation of evidence — practise constructing arguments that reference specific physical mechanisms.

Prompt 83: Wind Power Analysis

Copy this prompt into your AI tool:

Present the formula for wind power and ask me to calculate the power available from a wind turbine given wind speed, air density, and blade length. Then ask me to calculate the actual power output considering the Betz limit and turbine efficiency. Discuss the factors affecting wind farm site selection.

What this helps you practise:

Calculating wind power and evaluating wind energy feasibility

How to use it well:

Wind power questions test your ability to apply the kinetic energy formula to a fluid flow — practise the derivation to understand where each term comes from.

Prompt 84: Nuclear Power: Benefits and Risks

Copy this prompt into your AI tool:

Probe my understanding by having me describe and justify how a nuclear fission reactor works, including the roles of the moderator, control rods, and coolant. Then present a discussion question about the benefits and risks of nuclear power and ask me to construct a balanced argument using physics principles and quantitative comparisons.

What this helps you practise:

Explaining nuclear reactor operation and evaluating nuclear energy

How to use it well:

Discussion questions on nuclear power require both technical accuracy and balanced evaluation — practise supporting each point with specific physical evidence.

Prompt 85: Thin Film Interference

Copy this prompt into your AI tool:

Test me on thin film interference in soap bubbles or oil films. Ask me to derive the conditions for constructive and destructive interference, then challenge me to calculate the minimum film thickness for a specific colour to appear. Include the effect of phase changes on reflection.

What this helps you practise:

Analysing thin film interference and calculating film thickness

How to use it well:

HL students should practise accounting for phase

changes at boundaries, which determine whether the path difference condition gives constructive or destructive interference.

Prompt 86: Single-Slit Diffraction Pattern Analysis

Copy this prompt into your AI tool:

Present a single-slit diffraction experiment and ask me to explain why a central maximum forms and where the first minimum occurs. Then ask me to calculate the angular width of the central maximum and predict how changing the slit width or wavelength affects the pattern. Ask me to sketch the intensity distribution.

What this helps you practise:

Analysing and predicting single-slit diffraction patterns

How to use it well:

HL students should connect the mathematical condition for minima to the physical explanation involving path differences from different parts of the slit.

Prompt 87: Diffraction Grating Calculations

Copy this prompt into your AI tool:

Pose a diffraction grating experiment and ask me to calculate the angles at which different orders of maxima appear. Then ask me to determine the maximum number of orders visible and explain the advantage of using a grating over a double slit for spectral analysis.

What this helps you practise:

Calculating diffraction grating maxima and spectral resolution

How to use it well:

HL diffraction grating questions combine calculation with conceptual understanding — practise explaining

why gratings produce sharper maxima than double slits.

Prompt 88: Hydroelectric and Tidal Power

Copy this prompt into your AI tool:

Present data about a hydroelectric dam including height and flow rate, and ask me to calculate the theoretical maximum power output. Then ask me to explain why the actual output is lower, identifying the sources of energy loss. Include a comparison of the environmental impacts of hydroelectric power versus fossil fuels.

What this helps you practise:

Calculating hydroelectric power output and evaluating environmental impact

How to use it well:

Hydroelectric power calculations apply gravitational potential energy concepts from mechanics — practise connecting the physics to the engineering context.

Prompt 89: Energy and Waves Exam Question Synthesis

Copy this prompt into your AI tool:

Create an IB Paper 2 style question that either combines energy production analysis with efficiency calculations and environmental evaluation, or presents an HL wave phenomena problem integrating diffraction and interference. Include calculation, explanation, and discussion components. Mark my response against IB standards.

What this helps you practise:

Completing comprehensive energy or wave phenomena exam questions

How to use it well:

Use this as an extended practice question to develop the ability to combine quantitative analysis with

qualitative evaluation in the format IB examiners expect.

Section 9

Practical Skills and Internal Assessment

The Internal Assessment (IA) is an individual scientific investigation worth 20% of your IB Physics grade, assessed against five criteria: Personal Engagement, Exploration, Analysis, Evaluation, and Communication. Developing strong practical skills throughout the course directly supports your IA performance.

A successful IA requires a focused research question, a well-designed methodology, thorough data analysis with uncertainties, critical evaluation of results, and clear scientific communication. The investigation should demonstrate personal engagement and connect to physics concepts at an appropriate level.

These prompts guide you through every stage of the IA process and build the broader practical skills — experimental design, data collection, error analysis, and scientific writing — that underpin strong performance in both the IA and Paper 3 data-based questions.

Prompt 90: IA Topic Exploration

Copy this prompt into your AI tool:

Ask me about my interests in physics and everyday phenomena I find curious. Based on my responses, suggest five potential IA investigation topics that would allow for meaningful data collection, appropriate physics analysis, and clear demonstration of personal engagement. For each, outline the independent and dependent variables.

What this helps you practise:

Generating personally engaging IA topic ideas with clear variables

How to use it well:

Use this prompt early in the IA process to identify a topic where your personal interest will drive a genuine investigation, scoring well on the Personal Engagement criterion.

Prompt 91: Research Question Formulation

Copy this prompt into your AI tool:

I will share my IA topic idea with you. Help me refine it into a focused, testable research question. Evaluate whether the question allows for quantitative data collection, meaningful analysis, and connection to IB Physics syllabus content. Suggest modifications to improve the scope and feasibility.

What this helps you practise:

Crafting a focused and testable IA research question

How to use it well:

A well-crafted research question is the foundation of a strong IA — use this prompt to ensure your question is specific, measurable, and appropriately complex.

Prompt 92: Experimental Design and Variables

Copy this prompt into your AI tool:

Challenge will describe my planned IA experiment. Ask me to identify all independent, dependent, and controlled variables. Then evaluate my experimental design for validity, reliability, and safety. Suggest improvements to my methodology and identify potential sources of systematic and random error.

What this helps you practise:

Designing valid experiments with appropriate variable control

How to use it well:

Use this prompt to stress-test your methodology before you begin data collection, catching design flaws that would be difficult to correct later.

Prompt 93: Data Collection Best Practices

Copy this prompt into your AI tool:

Ask me about my planned data collection procedure and evaluate it against IB IA standards. Check whether I plan to collect sufficient data points, include repeat measurements, record raw data with appropriate units and uncertainties, and present data in a clear table format. Suggest specific improvements.

What this helps you practise:

Planning thorough and well-organised data collection procedures

How to use it well:

Good data collection cannot be retrospectively fixed — use this prompt before your practical sessions to ensure your data will support strong analysis.

Prompt 94: Data Processing and Graph Construction

Copy this prompt into your AI tool:

Present a set of raw experimental data and ask me to process it appropriately: calculate means, propagate uncertainties, linearise if necessary, and describe how I would construct a graph with error bars. Then ask me to explain what information the gradient and intercept of my graph would provide.

What this helps you practise:

Processing experimental data and constructing appropriate graphs

How to use it well:

The Analysis criterion rewards thorough data processing — practise transforming raw data into

meaningful graphs with correctly calculated uncertainties.

Prompt 95: Uncertainty Analysis in Practice

Copy this prompt into your AI tool:

I will describe my IA measurements and their associated uncertainties. Guide me through calculating the percentage uncertainty in each measurement, propagating uncertainties through my calculations, and determining the overall uncertainty in my final result. Ask me to compare this with any literature values.

What this helps you practise:

Performing complete uncertainty analysis for IA investigations

How to use it well:

Uncertainty analysis is where many IAs lose marks — use this prompt to ensure your error propagation is thorough and correctly connects to your evaluation.

Prompt 96: IA Evaluation Writing

Copy this prompt into your AI tool:

Present a hypothetical set of IA results and ask me to write an evaluation that identifies systematic and random errors, assesses the validity of the method, and proposes specific, realistic improvements. Evaluate my response against the IB Evaluation criterion markband descriptors.

What this helps you practise:

Writing critical evaluations that meet IB IA standards

How to use it well:

The Evaluation criterion requires genuine critical analysis, not generic statements — practise connecting specific experimental weaknesses to specific improvements.

Prompt 97: Scientific Communication Standards

Copy this prompt into your AI tool:

Pose a paragraph from a scientific report and ask me to improve its clarity, precision, and adherence to scientific conventions. Test whether I can identify where units are missing, where significant figures are inconsistent, and where the language is too informal for a scientific investigation report.

What this helps you practise:

Writing with scientific precision and appropriate conventions

How to use it well:

The Communication criterion assesses your scientific writing quality — use this prompt to develop the precise, formal style expected in IB scientific reports.

Prompt 98: IA Draft Feedback

Copy this prompt into your AI tool:

I will share a section of my IA draft with you. Provide detailed feedback against all five IB IA criteria: Personal Engagement, Exploration, Analysis, Evaluation, and Communication. Suggest specific, actionable improvements for each criterion and estimate the markband level of the current draft.

What this helps you practise:

Receiving structured feedback on IA investigation drafts

How to use it well:

Submit sections of your IA to this prompt iteratively to improve each criterion before final submission, addressing the weakest areas first.

Prompt 99: Paper 3 Data-Based Question Practice

Copy this prompt into your AI tool:

Simulate an HL Paper 3 data-based question by presenting unfamiliar experimental data with a description of the methodology. Ask me to process the data, draw appropriate graphs, analyse uncertainties, and draw conclusions. Include questions about the validity of the experimental method and suggestions for improvement.

What this helps you practise:

Completing Paper 3 data-based questions under exam conditions

How to use it well:

HL students should practise Paper 3 data questions regularly, as they test practical skills in a written format and require the same analytical approach used in the IA.

Prompt 100: Practical Skills Self-Assessment

Copy this prompt into your AI tool:

Present the five IB IA criteria with their markband descriptors and ask me to self-assess my current IA draft against each one. For any criterion where I score below the top band, guide me to identify specific weaknesses and create an action plan for improvement before the submission deadline.

What this helps you practise:

Self-assessing IA work against IB markband descriptors

How to use it well:

Use this prompt as a final check to ensure your IA meets the descriptors for each criterion, converting the abstract markbands into concrete improvements.

Final Closing Note

You have now worked through 100 prompts designed to help you think more clearly, revise more effectively, and prepare more confidently for your GCSE.

Remember: the goal was never to rely on AI for answers. The goal was to use it as a tool to test, challenge, and strengthen your own understanding.

The strongest students are not those who avoid difficulty, but those who engage with it deliberately. Each mistake you identified, each explanation you improved, and each gap you filled has strengthened your thinking.

As you continue your studies, aim to depend less on prompts and more on your own judgement. AI can support you — but your reasoning, clarity, and persistence are what earn marks.
Approach your exams calmly. Think carefully. Write clearly.
You are more prepared than you think.

Using AI Beyond This Book

The prompts in this book are starting points, not final forms.

As you grow more confident, begin modifying them:

- Add constraints (for example, “limit to three key points”).
- Increase difficulty gradually.
- Ask the AI to challenge your reasoning.
- Request alternative explanations.
- Ask it to critique your thinking rather than provide answers.

The most powerful use of AI is not asking it to tell you things — it is asking it to test and refine your thinking.

In the future, those who understand how to use tools intelligently will have an advantage. Treat AI as a tutor, not a shortcut. The skill of asking better questions will continue to matter long after your exams are over.

About the Author

James R. Martin holds an MSci in Physics from the University of Bristol and a PGCE with a Physics focus from the University of Oxford. He has over a decade of experience teaching and tutoring students aged 11–18 across a range of subjects, including Physics, Biology, Chemistry, Mathematics, Economics, and Electronics.

He has worked with multiple syllabi, including GCSE, A-Level, KS3, and the International Baccalaureate Diploma Programme (IBDP), supporting students of varying abilities to develop clarity, confidence, and exam success.

His work focuses on effective revision strategies, independent thinking, and the responsible use of artificial intelligence as a tool to strengthen — not replace — understanding.

Other Titles in This Series

The *100 AI Prompts for Smarter Revision* series supports students across GCSE, A-Level, and IBDP subjects.

GCSE

- English Language
- English Literature
- Mathematics
- Physics
- Biology
- Chemistry
- Geography
- History
- Computer Science
- Economics
- Business Studies
- Religious Studies
- Psychology
- French
- Spanish
- German

A-Level

- Mathematics
- Further Mathematics
- Physics
- Chemistry
- Biology
- Economics
- History
- Geography
- English Literature
- Psychology
- Computer Science

• Politics
• Business

IBDP

• Mathematics: Analysis & Approaches
• Mathematics: Applications & Interpretation
• Physics
• Chemistry
• Biology
• Economics
• Geography
• History
• English A: Literature
• English A: Language & Literature
• Psychology
• Business Management
• Computer Science